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OUR FIRST OBJECTIVE

HERMAN S. MAYEUX¹

The Florida Entomological Society is 40 years of age; has over 250 members; conducts an annual meeting and publishes four issues each year of THE FLORIDA ENTOMOLOGIST.

The Society has a glowing history beginning on January 5, 1916, with eleven charter members. As with most children, the child-age society passed its first years in the pleasant and ideal surroundings of its maternal home at the state land grant college, The University of Florida. During this early stage the young society was given little to do, other than to grow and develop.

Then came the stormy adolescence of the depression years when our youngster developed a slight twitch and threatened to become cross-eyed. By that time he was scattered thinly across this great State, unruly, disorganized in his thinking, nervous and irresponsible.

As adulthood approached, our Society began taking its responsibilities more seriously. It matured the constitution and the by-laws; greatly improved the annual meetings; and developed the publication to a level that it ranks as a truly creditable and worthwhile scientific journal.

There is no fountain of youth. There is no reliving a second childhood or adolescence. These stages in development are past. It is my happy privilege to proclaim that the Florida Entomological Society is a *mature organization*. Furthermore, it is my considered opinion, and I have just had twelve months to think on it, that this Society is now at the stage in its existence when it can, and must start to fulfill more fully the purposes for its existence as enumerated so simply yet forcefully in its constitution.

The constitution begins with these words: "The association shall be known as the Florida Entomological Society. The objectives of the Society shall be: (1) *to promote the study of entomology*; (2) to encourage research relative to insects and related arthropods in Florida; (3) to distribute widely knowledge pertaining to insects; and (4) to publish THE FLORIDA ENTOMOLOGIST."

As stated in opening, the Florida Entomological Society holds an annual meeting and publishes THE FLORIDA ENTOMOLOGIST. This about sums it up. We make no excuses for not having done more, and we are proud of these accomplishments. Nevertheless, both of these actions are largely of a selfish nature—entomologists holding meetings and publishing for entomologists. It is time we begin work on the first objective given in the Constitution, "to promote the study of entomology." In order to promote the study of entomology it is necessary to influence people *outside* of our profession in various ways. First, inform them of what we are, what we do, and promote a respect and appreciation of our contribution to the general welfare. Second, sell entomology as a science of many facets, a field of variety, a profession of intrigue and action, which offers much to young men and women.

As C. R. Jordan (1956), immediate Past President of Georgia Entomological Society, expressed it, "The word 'entomology' does not exist in the

¹ Florida Agricultural Supply Company. Presidential Address, Thirty-ninth Annual Meeting, Tallahassee, Florida, August 30, 1956.

vocabulary of the average person." He quoted R. H. Nelson, Executive Secretary of The Entomological Society of America as writing, "I get a little weary of people looking blank at the mention of the word entomologist but reacting knowingly to the no less polysyllabic terms of psychiatrist or pediatrician."

J. Wayne Reitz (1955), University of Florida President, recently expressed his concern for the future in these words, "In the South alone, we shall need 35 thousand new college instructors and research workers in the next ten years. At the present rate of graduate degree output it is estimated that only 18 thousand Ph.D.s will be produced in that ten year period, of which approximately half will go to industry."

As early as 1947 the speaker estimated that at the present rate of production it would require the universities of the South ten years to supply sufficient entomologists to fill the requirements of agriculture for one phase alone, namely that of farmer-employed, consultant entomologists. Work is waiting for literally hundreds in this capacity in the area from South Texas, across the Cotton Belt and into Southern Florida. Yet, the demand for men in other facets of the profession is so great that very few private consultants are to be found at this time, nine years later.

In his presidential address at our thirty-fifth annual meeting John W. Wilson (1953) had these words to say in closing, "Because it is alive and dynamic, more and more young people will be attracted to economic entomology as a profession. Through the combined efforts of present and future members of our profession, the science of economic entomology will move on to greater developments and larger services to mankind."

Let me repeat! "Through the combined efforts of present and future members of our profession, the science . . . will move on to greater developments. . . ." Now, let me suggest to you that in Florida the best mutual ground upon which entomologists can combine their efforts to impress upon the general public the value of entomology and influence young people to enter the field of entomology is through the Florida Entomological Society.

Your Executive Committee has met on three different occasions during the past twelve months. The situation, as has been presented before you here, was agreed upon by the Committee as true and accurate. The Executive Committee authorized the President to take certain actions before this thirty-ninth annual meeting. First, an amount not to exceed fifty dollars was to be spent to publicize this meeting, in a manner as to interest people in entomology. Charles E. Brian has handled this task admirably, serving as the PUBLICITY COMMITTEE.

Second, the booklet entitled "Opportunities in Professional Entomology" was to be mailed to every high school in the State of Florida. The Society purchased, and the Secretary mailed, 500 copies to school libraries and to vocational agricultural teachers.

Third, a committee was to be appointed to assemble a set of color slides on the subject "Entomology In Action" covering the several facets of entomology. Furthermore, this committee was instructed to write a sample or model talk of a type suitable for use with the slides before groups of young people of high school age. M. Lewis Wright and his committee have performed this task and the talk will be given on this program with the slides. Sets of the slides and copies of the talk will be available from the

Secretary. Each and every member is hereby appointed to the "Committee to Recruit Entomologists". Our service on this committee will consist of making at least one selling talk during the next 12 months.

Fourth, the plans were to be developed for a portable exhibit on the subject "Entomology In Action" for display at various schools, fairs and other functions that attract the general public, especially young people. A selling piece, this exhibit to have the purpose of acquainting the public with entomology and its value, and to present its various facets in such a way that the individual can place himself mentally in the nitch that fits him best, whether it be teaching, laboratory research, field research, extension education, manufacturing, consulting, selling, commercial application, or bee culture. At least one such plan is to be presented at our business meetings. The speaker and the entire Executive Committee urge the Society to authorize the incoming Executive Committee to have this exhibit built and in use by the time of the 40th annual meeting, one year from now.

We, the Executive Committee, have taken these actions which we believe are fully authorized by the Society constitution. During this same year the Editor has expanded the publication. While we advance in one phase we are not shrinking in another.

With these examples of actions which are being taken to accomplish our first objective, which is to promote the study of entomology, we challenge your imagination as to the next step. We sincerely believe that you, as the membership, will approve entry into this new phase of Society activity; and we urge that you resolve that it be continued.

I now take much pleasure in dedicating this 39th Annual Meeting of The Florida Entomological Society to the theme, *entomology in action*.

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EFFECTS OF LARVAL NUTRITION ON THE LIFE CYCLE, SIZE, COLORATION, AND LONGEVITY OF *CHRYSOPA LATERALIS* GUER.¹

MARTIN H. MUMA
Citrus Experiment Station
Lake Alfred, Florida

Life cycles of predators of the genus *Chrysopa* have been determined by several workers. The earliest and most thorough studies were conducted by Smith (1921, 1922) who investigated not only the life cycles but many other facets of the biology of several species. Later studies include those of Smith (1931), Putnam (1932, 1937) and Frazer (1945). None of these workers, however, investigated the life cycle of *C. lateralis* Guer.² Studies reported here were initiated when wide variation in larval food acceptance and trash packets of *lateralis* were observed. It was felt that adequate evaluation of the importance of *lateralis* in the biological control of citrus insects and mites would have to be based on a knowledge of the life cycle and food range of the species.

METHODS

All the data presented here were accumulated in the laboratory under artificial conditions. Life cycles were determined in constant temperature cabinets at 80° F. under regulated light conditions. Humidity was not controlled but maintained at the highest level obtainable with water evaporating dishes.

Deep petri dishes were utilized as rearing cages except when larvae were in the first instar and escaped readily. First instar larvae were held in cotton-stoppered test tubes.

All life cycles were initiated with eggs laid by grove-collected, gravid females. When citrus leaves heavily infested with selected hosts were obtainable, larvae were presented with them and permitted to search for and feed on the selected food as naturally as the cages permitted. Uninfested citrus leaves provided with a comparable density of eggs of *lateralis* were utilized when larvae were fed cannibalistically. Food was changed as needed—in most instances daily.

RESULTS AND DISCUSSION

As large populations of *lateralis* are frequently associated with heavy infestations of Florida red scale, this insect was first utilized as a probable preferred food in the early summer of 1953. A life cycle of 4, 4, 4, 5 and 12 mean days was obtained respectively for egg, first instar larva, second instar larva, third instar larva and pupa. When these data were compared with the range for the genus published by Smith (1921), no striking

¹ Florida Agricultural Experiment Station Journal Series, No. 511.

² W. E. Bickley, in recent correspondence, states that the name *Chrysopa cubana* Hagen should be applied to this species.

TABLE 1.—VARIATION IN THE LIFE CYCLE AND LONGEVITY OF *Chrysopa lateralis* GUER. WHEN LARVAE WERE SUPPLIED WITH DIFFERENT HOSTS UNDER LABORATORY CONDITIONS AT 80° F.

WITH DIFFERENT HOSTS UNDER LABORATORY CONDITIONS										
Larval food	Total lateralis larvae	Mean number of days for development					Total	Percent Mortality	Mean Adult Longevity in days	
		1st Instar	2nd Instar	3rd Instar	Pupa					
Six-spotted mite	40	3.9	3.5	5.7	12.3	25.4	2.5	2.0		
Fla. red scale	66	5.4	5.0	6.4	12.0	28.8	28.8	2.2		
Citrus red mite	25	4.9	5.1	10.7	11.9	32.6	68.0	0.9		
Purple scale	60	5.1	6.8	11.5	13.7	37.1	61.7	2.8		
Cannibalism	10	4.8	8.4	12.0	12.5	37.7	80.0	1.0		
Cloudy-winged whitefly	60	5.6	6.2	19.1	16.6	47.5	60.0	2.5		

TABLE 2.—VARIATION IN THE SIZE AND PROPORTION OF ADULT *Chrysopa lateralis* GUER. WHEN LARVAE WERE SUPPLIED WITH DIFFERENT FOOD HOSTS UNDER LABORATORY CONDITIONS AT 80° F.

Source of Specimens * Head	Mean millimeter width				Mean Millimeter		Mean life cycle in days at 80° F.
	Interocular	Prothorax	Humerus		Wing length	Wing width	
Grove collected	1.40						
Whitefly reared	1.30						
Purple scale reared	1.22						
Fla. red scale reared	1.44						
Six-spotted mite reared....	1.48						
	.76	1.04	1.98		12.34	4.16	47.5
	.68	.97	1.73		10.43	3.43	37.1
	.65	.90	1.62		9.70	3.23	28.8
	.76	1.08	1.98		11.42	4.09	25.4
	.76	1.12	1.98		11.81	4.16	

* No data are cited for specimens fed on citrus red mite or cannibalistically as less than ten adults were reared.

discrepancies were noted and life cycle studies on the species were terminated.

In the winter and spring of 1954-55, however, larvae were noted feeding on, and building packets with, several different hosts. Life cycle studies were renewed at that time as an adjunct to determination of the preferred host for the species. Six-spotted mite, *Eotetranychus sexmaculatus* (Riley), Florida red scale, *Chrysomphalus aonidum* (L.), purple scale, *Lepidosaphes beckii* (Newm.), cloudy-winged whitefly, *Dialeurodes citrifolii* (Morg.), citrus red mite, *Metatetranychus citri* (McG.) and eggs of *lateralis* were all used as food for *lateralis* larvae during this later study. Although the larvae accepted and fed on each of the hosts provided, rather striking differences in length of life cycle were soon noted (Table 1). Such a strong reaction to a variation in larval food was not expected, as the species is known to feed on a wide variety of hosts.

When adults requiring long developmental periods emerged, they were much smaller and paler than adults undergoing short developmental periods. In order to check this observation, ten adults were selected at random from the specimens reared on each host. Several anatomical structures, those least affected by desiccation, were measured with an ocular micrometer and means computed. Anatomical measurements of these specimens and those from a series of ten grove-collected specimens proved a decided variation in size (Table 2). Less than ten specimens were reared on citrus red mite and cannibalistically so the effect of these foods could not be adequately determined.

Unfortunately, the coloration of pinned specimens of the genus *Chrysopa* fades quickly. No record of the color variation is available. Adults with short developmental periods were darker green than those with long periods, but not so dark as specimens collected from groves.

Another variation noted was that of adult longevity (Table 1). Emerging adults were provided with citrus honey as food and held in the cages until they died. Longevity, although variable, was not consistent with the variation obtained for either life cycle or adult size. Therefore, no conclusion can be drawn concerning the relationship of larval food to adult longevity.

The results of these studies indicate that variation of the larval food of *lateralis* produces variation in the life cycle of the species and variation in the size, coloration, and longevity of adults of the same generation. It is believed that the variations so obtained are the result of nutritional differences rather than of mechanical starvation caused by difficulties in feeding. An analysis of the data accumulated for the various hosts definitely indicates this. Use of six-spotted mite as food resulted in the shortest cycle and largest adults despite the small size and relative inaccessibility of the mites beneath their webbing. Conversely, use of cloudy-winged whitefly as food resulted in the longest cycle but intermediate-sized adults, even though eggs and nymphs of the whitefly are readily accessible and the nymphs are reasonably large. If these variations had been due to feeding difficulties, the smallest, least available food should have produced the smallest adults after a long developmental period with the reverse being true for the largest, most available food.

A comparison of the several lengths of life cycle obtained for *lateralis* with published life cycles of other species is given in Table 3. Variation

in the life cycle of *lateralis* approaches the range for the genus published by Smith in 1921 and is similar on certain foods to the long and short cycles of various species studied by Smith (1931), Putnam (1937) and Frazer (1945). It would seem from these data that nutrition, a factor not usually considered in studies on the life cycles of species of the genus *Chrysopa*, could be as important as temperature, a long-recognized factor.

TABLE 3.—COMPARISON OF LIFE CYCLES PUBLISHED FOR OTHER SPECIES WITH THOSE OBTAINED FOR *C. lateralis* GUER. IN THE PRESENT STUDY.

Species and Authority	Egg	Number of days to complete development			Pupa	Total
		1st Larva	2nd Larva	3rd Larva		
Range for genus	4 to 12	3 to 11	2 to 7	4 to 10	15-up	28 to 50
Smith (1921)						
<i>plorabunda</i>	6	—————>		12	15	33
Putnam (1937)						
<i>nufilabris</i>	7	—————>		13	12	32
Putnam (1937)						
<i>damiensis</i> Smith	4	3	4	5	18	34
Smith (1931)						
<i>exterior</i> Navas	4	—————>		12	12	28
Smith (1931)						
<i>thoracica</i> Walker	4	—————>		10	11	25
Smith (1931)						
<i>dorsalis</i> Burm.	9	4	6	——>	19	38
Frazer (1945)						
<i>lateralis</i> Guer.						
Six-spotted mite host	4	4	4	6	12	30
Fla. red scale host	4	5	5	6	12	32
Citrus red mite host	4	5	5	11	12	37
Purple scale host	4	5	7	12	14	42
Cannibalism	4	5	8	12	13	42
Cloudy-winged whitefly	4	6	6	19	17	52
host						

The results reported in the present study also support the contention of Thompson (1951) that many predators are more host specific than published literature indicates. Although all possible hosts have not been utilized it would seem that the large, dark green adults of *lateralis* that are observed in citrus groves do not develop on hosts such as purple scale or cloudy-winged whitefly alone. Hosts probably include six-spotted mite, Florida red scale and possibly some other insect or mite not included in this study but perhaps equally capable of producing large, dark colored adults in a short period of time. The effect of nutrition or host specificity

on longevity is not clearly indicated from the present study but may prove on investigation to be equally pertinent.

Variations in length of life cycle, adult size and coloration, and adult longevity induced by variation of larval nutrition as reported here are complementary to the findings of Meyer and Meyer (1946). These two workers, experimenting with *Chrysopa vulgaris* Schr., reported divergence of the species in response to larval food changes after four generations. They further believed that this divergence was due to natural selection and possibly represented the beginnings of divergence of biological forms within a species. Although the findings reported here are similar in connotation to those of Meyer and Meyer, the present studies were not continued beyond the first filial generation as would be necessary before definite conclusions could be reached on the impact of source of food on divergence of biological forms within a species. This study was not continued beyond F₁ because *lateralis* could not be induced to mate in the laboratory.

SUMMARY

The length of the life cycle of *Chrysopa lateralis* Guer. was determined in the laboratory at 80° F. wherein the larvae were fed six-spotted mite, Florida red scale, purple scale, cloudy-winged whitefly, citrus red mite, or cannibalistically. The variation thus obtained was found to approximate the previously published range for the genus. Variation in adult size, coloration and longevity accompanied variation in life cycle. These variations are believed to be due to nutritional inadequacies rather than mechanical starvation and to be a reflection of the host specificity of the species.

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ENDRIN: Budworms, Cabbage Worms, Cotton Boll Weevil, Cotton Bollworm, Cotton Fleahopper, Fall Armyworm, Grasshoppers, Hornworms, Leafworms, Rapid Plant Bug, Spiny Bollworm, Sugar Beet Webworm, Tarnished Plant Bug, Thrips.

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REPRESENTATIVES IN PRINCIPAL CITIES

INSECTICIDE DOSAGE ON CITRUS¹

J. T. GRIFFITHS²

In 1953, I delivered a presidential address entitled, "Where Do We Go From Here?" Since that time, I have continued to ponder the end result of citrus spray programs. Today I want to present some thoughts which I hope may change our approach to this grove operation. Although I am feeling my way at this time, I hope this may serve as a starting place for reconsideration of spray methods.

A spray program for citrus is supposed to produce the best quality fruit possible at the lowest practicable cost. This means that proper insecticides must be used, they must be sprayed at the proper time, and they must be efficiently applied. However, there is no justification for applying more than enough material to produce control, and it need be applied only thoroughly enough to attain that control. It is therefore essential that there be a good criterion of dosage. Today growers apply from 250 to 2500 gallons per acre depending upon the material and who is running the operation. Five hundred gallons per acre is the amount most commonly used.

More and more growers are using concentrated sprays in some form. This method of spraying needs some refinement, but it offers a major means of reducing spray costs. The advent of concentrated sprays offers an excellent opportunity to think in terms of pounds of insecticide per acre rather than pounds per 100 gallons and gallons per tree. I would like to see insecticide recommendations expressed as pounds per acre and based upon average tree height. This is an easy figure to find, and it is not subject to the variation that arises when a production figure (i.e.: a 6 box orange tree) is used.

Problems associated with the use of sulphur may be somewhat different from those presented by other insecticidal materials, but sulphur offers an excellent example of the problems faced by the production manager today. Although the use of sulphur increases other insect problems, many growers are using more sulphur today than ever before.

In the operation under my control, sprayers are usually set to spray four rows across a 40 acre block. Thus, where rows are thirty feet apart, each row represents a trifle more than one acre. The setting of the nozzles, the speed of the spray machine and the gallons per acre are constant, whether the machine is in young trees or in an old grove. The amount of material is changed from block to block and represents the only variable in the entire application. Nozzles may be adjusted up or down to accommodate to tree height, but the foreman is primarily concerned with one variable, the number of bags per tank.

There are three questions concerning sulphur sprays for which we need answers: (1) What size rust mite infestation should be treated; (2) How much sulphur is required; (3) How thorough an application should

¹ Presented at the Thirty-ninth annual meeting of the Florida Entomological Society, August 30-31, 1956.

² Eloise Groves Association, Winter Haven, Florida.

be made? These three questions should be considered in the light of how the use of sulphur may be minimized.

Rust mite infestations do not behave in the same manner at all times of the year. During the summer, increases are extremely rapid and injury can result almost over night. During the fall and winter, populations increase slowly and injury is much less apt to occur. This means that control is less urgent in the fall and winter than in the summer. In the fall, a moderate infestation may be allowed to drift for a month or longer with no danger involved; whereas, such a situation in June would result in severe injury. Complications with dry weather and/or mesophyll collapse sometimes occur in the fall, but these instances may be considered unusual.

The grower needs some more definite means of determining when an application for rust mite control should be made. In my own operation, I am inclined to apply sulphur within ten days to two weeks after finding twenty to thirty per cent of the fruit infested in the summertime, whereas such populations in the fall would be checked again within two weeks and a reappraisal made of the situation.

It has been my experience, that an actual sulphur application can often be saved in the fall of the year by careful checking and by delaying sulphur until the population has increased to a relatively high level (50 to 60% of the fruit infested).

After it has been decided to apply sulphur, the next question is how much to use. I am coming to one of two conclusions; either sulphur need not be varied a great deal in proportion to tree size, or we are using more than is needed in most applications. Thus, during the past two years, in the groves under my care about 50 pounds per acre has been a fairly standard dosage on orange trees and 75 pounds per acre on mature grapefruit. However, when amounts were reduced to as little as 40 pounds per acre on both oranges and grapefruit, no differences were found. I know of growers who go as low as 25 pounds per acre in mature groves with apparent success. How much sulphur is really needed?

The methods for applying sulphur must also be considered. In my own experience, coverage is not a major consideration so far as sulphur is concerned. Within certain wide limits, the thoroughness of application is probably of little or no consequence, although it may be that if minimum amounts were used, coverage would become more important. For the past three years, we have been using a double-head speed sprayer and driving at $2\frac{1}{2}$ miles per hour. This has been most satisfactory. We have used sulphur dust on numerous occasions and it has been applied at speeds in excess of 3 miles per hour, but at about the same rate of sulphur per acre as with sprayers. For practical purposes, results with dust have been as good as with spray applications.

These experiences lead me to suggest that our sulphur application may be considerably reduced in cost by having definite answers on the minimum dosage and minimum coverage required. Sulphur reduction will yield gratifying results in other insect and mite problems. We are a long way from knowing how much to use and how well it should be applied.

Other insecticides, fungicides, nutritional and physiological sprays present individual problems and these are as complex as those for sulphur. The grower who is trying to reduce spray program costs must do so either

by reducing the number of applications, by reducing the amount of material, or by finding cheaper means of application. The use of concentrated sprays and the knowledge of effective minimum dosage and coverage offer excellent opportunities for improvement in the cost picture.

We must get a clear picture of minimum dosage and minimum coverage. The slogan, "More Insecticides, Better Applied", has no merit if the extra material and the better coverage are unnecessary.

CARL F. LADEBURG

Entomology lost a true friend and scientist in the death of Carl F. Ladeburg October 16, 1956 at Veteran's Hospital, Coral Gables, Florida.

Not only was he responsible for many developments in the pesticide field within his own firm, but this interest, knowledge, and thoroughness extended to many related problems of technical and practical nature in a wide range of crops and enterprises.

Carl Ladeburg was an outstanding industry representative in systematizing and enumerating pesticide developments, particularly since and during World War II, including valuable contributions to such endeavors as the first "Handbook on Pesticides and their Uses in Florida".

At the time of his death, he worked closely with many agencies on such factors as pesticide residue, tolerances, laws and usages. All of his efforts were marked by carefully detailed work in the interest of the industry which he so ably represented.

Carl Ladeburg was born November 26, 1897, in Magdeburg, Germany and attended schools in that country. On coming to the United States he did post graduate work at the University of California at Los Angeles. He was then employed by the firm of McLaughlin, Gormely & King, Inc., Minneapolis, Minnesota. Later in March, 1940, he came to Florida on the staff of the Kilgore Seed Company as an entomologist, and subsequently became manager of the Insecticide Division of that firm.

His service record includes the U. S. Army from July 18, 1942, to March 6, 1943, at which time he returned to his position with the Kilgore Seed Company. He served in the Coast Guard Reserve and was honorably discharged.

Carl Ladeburg was an enthusiastic fisherman, accomplished amateur astronomer, and an active member of the following organizations and professional societies: American Legion, American Cancer Society, The Soil Science Society of Florida, The Manufacturing Chemists Association, Inc., Association of Food & Drug Officials of the United States, The Florida Entomological Society, The American Chemical Society, The Entomological Society of America, The National Agricultural Chemicals Association, The Florida Agricultural Research Institute, The Florida State Horticultural Society, and The Florida Turf Association.

WILLIAM P. HUNTER

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THE GENUS *EULALIA* IN FLORIDA AND THE WEST INDIES

MAURICE T. JAMES
State College of Washington
Pullman

The discoveries of a new *Eulalia*, and of an apparent case of anomalous distribution which helps to throw light on a problem of systematics within that genus, have pointed out the desirability of reviewing the genus as it occurs in this area. *Eulalia* is here used as it was defined by James and Steyskal (1952); the species referred to the related *Hedriodiscus* are, consequently, omitted.

1. Thorax almost entirely black, except apex and sometimes lateral margins of scutellum; vein R_1 absent (present in some related extralimital species) 2
 Thorax with at least postalar callus and some pleural areas reddish to yellow, these areas always distinct in the females, sometimes obscure in the males; vein R_1 present; antennal style acute; abdomen dorsally with ground color basically yellow, and with black transverse markings or with a black longitudinal stripe which may, however, cover most of the dorsal surface (subgenus *Eulalia*)..... 4
2. First antennal segment 1.5 length of second; vein M_1 distinct only at base, represented otherwise by an impressed line or fold; abdomen black dorsally, with narrow broadly interrupted yellowish apical margins on segments two to four; antennal style blunt, the last (sixth flagellar) segment but little longer than wide (subgenus *Achlyomyia*) *interrupta*
 First antennal segment no longer than second; vein M_1 distinct throughout or more distinct on its apical than on its basal half; abdomen greenish-yellow dorsally, usually with a longitudinal black stripe which may, however, be almost the width of the abdomen on segments three and four of the female (subgenus *Odontomyia*)..... 3
3. Antennal style acute, the last (sixth flagellar) segment at least twice as long as wide; the pile beneath the front basitarsus as long as the width of the segment or nearly so; front of female usually with a pair of yellow spots below the ocelli.....the *pilimana* complex
 Antennal style blunt, the last segment but little longer than broad; the pile beneath the front basitarsus of ordinary length; front almost wholly black *virgo*
4. Style elongated, its terminal segment (sixth flagellar) longer than the fourth flagellar; abdomen of female dorsally black, with narrow lateral margins which are not sharply defined; abdomen of male with a longitudinal black stripe, narrowest on the third tergum, and covering approximately the median third of the abdomen.....*evansi*
 Style short or of moderate length, its terminal segment not more than two-thirds the length of the fourth flagellar; abdominal patterns varied, but well-defined, in both sexes..... 5

5. Abdomen yellow to greenish-yellow, with a dorsal longitudinal stripe confined to the median third or fourth; pile of mesonotum deep yellow to brassy; face of male and face and front of female yellow, without distinct black spots *bahamensis*
 Abdomen basically yellow, but with black markings either in the form of cross-bands or of a median stripe which is expanded beyond the median third at the anterior margins of the terga; mesonotal pile white or silvery; frons of female with distinct black markings..... 6
6. Black markings of abdominal terga broad, trapezoidal, covering a large part of the respective tergum but broadly separated from the spots on the adjacent segments; face of male reddish-yellow medially and black laterally *bermudensis*
 Black markings of abdominal terga not trapezoidal, at least on segments two and three, and more restricted in area, but at least narrowly connected to those of adjacent segments, sometimes in the form of a dorsal stripe 7
7. Black markings of abdominal terga broadly connected with those of the adjacent segments and also broadly expanded anteriorly to the lateral margins so as to take in the anterior fourth of tergum 3 and the anterior half of tergum 4; the surrounded pale areas on terga 3 and 4 almost oval; male with black face and wholly black mesonotum *rufipes*
 Black markings of abdominal terga but narrowly connected with those of adjacent segments in the female, broadly so in the male, the anterior expansion of the black very narrow in the female and lacking in the male, the pale areas consequently either not enclosed or not oval; face and sides of mesonotum of male yellow to green..... *cincta*

Eulalia (Eulalia) evansi, n. sp.

MALE: Head predominantly black; face yellow, except on sides, particularly above, and in depression above, oral margin; oral margin and lower facial orbits yellow; labella brownish; palpi pale yellow. Face at oral margin (37 micrometer units; $30 = 1$ mm.) distinctly wider than its height (30); face gradually broadening downward, the sides, from front view, distinctly bowed. Eyes bare. Pile of head white to silvery; that of face bushy, abundant; narrow facial orbits silvery tomentose. Antennae brownish-yellow to blackish, variable, but characteristically the first two segments blackish with yellow apices, the flagellum brownish-yellow or reddish-yellow basally, becoming darker toward apex, but the terminal segment also reddish to brownish-yellow. Ratio: first segment 7, second 7, flagellum 27; flagellar segments typically 6:5:4:5:1:6.

Thorax mainly black, the following areas yellow: humeri; narrow lateral margins of mesonotal suture; postalar calli and area immediately preceding each; scutellum except broad basal area; scutellar spines except extreme apices; sclerites at wing base and adjacent mesopleural and pteropleural areas; and some indistinctly outlined pleural areas, especially around the anterior spiracle and along the upper margins of the sternopleura. Mesonotal tomentum silvery, scattered; mesonotum and pleura with conspicuous silvery pile. Legs yellow; the coxae mainly blackish, the

femora at most somewhat discolored toward apices. Wings hyaline; veins yellow; R₁ present, r-m and m-cu short. Halteres ivory.

Abdomen yellow; a median stripe extending from the base of the abdomen to the middle of the fifth tergite; this stripe occupying about the median third of the third segment and almost half of the fourth; from the third forward it widens gradually, so that most of the first segment is black; pile white, much less conspicuous than on the thorax, but the pile and pollen of the venter giving it somewhat of a silvery sheen. Genitalia yellow. Length, 10-11 mm.

FEMALES: Head predominant yellow, the following black: a transverse band on the vertex, crossing and including the ocellar triangle but not reaching the eyes; a pair of oval spots on the middle of the frons (or a broadly interrupted, arcuate transverse band in this area); a round spot adjacent to each eye just below the plane of the insertion of the antennae; and the proboscis, excluding the labellae. Width of vertex 33, gradually increasing to 40 at base of antennae; face almost parallel-sided. Frons strongly convex, both in lateral and transverse profile. Antennae, in color and structure, as in the male. Pile of head as in the male, but less conspicuous. Mesonotum colored as in male but may be more extensively yellow laterally behind the suture; scutellum wholly yellow or black only at the base. Pectus, a connected spot on each mesopleuron, and the posterior margins of the metapleura black; pleural regions otherwise yellow. Prosterum discolored; mesosternum black. Pile of pleura and sides of mesonotum as in the male, but less conspicuous; mesonotum in addition with yellow tomentum which appears to be interrupted in a pair of ill-defined median stripes. Abdomen black or blackish dorsally, with a poorly defined yellow margin; the black may grade strongly into discoloration. Venter extensively brownish-yellow to discolored. Otherwise, except sexually, as described for the male.

Holotype: male, Cape Sable, Monroe Co., Florida, April 22-25, 1955. Biol. note 1027; James collection. *Allotype*: same data, Biol. note 1026. *Paratypes*: 6 ♀, 12 ♂, same data, Biol. notes 1021, 1022, 1023, 1024, 1025A, 1026, 1027; 4 ♀, 3 ♂, same data but March 24, 1954, Biol. notes 723, 732, 733B, 735, 740, 741; 1 ♂, Everglades, Florida, April 9, 1912; 1 ♂, Cape Flamingo, Florida. All the Cape Sable specimens were collected by Dr. Howard E. Evans, but they are not so indicated on the label.

The relationship of this species to *E. microstoma* (Loew) is close. The antennal style is long in both species; it is slightly the longer in *microstoma*. In that species, also, the pile of the head and thorax is distinctly yellowish; vein R₁ is wanting; the female is paler in coloration, the dark spots being usually light brown and those below the plane of the antennal insertion being absent; and the face of the male is predominantly black, the median area sometimes castaneous and the lower orbits yellow. It is possible that *evansi* is a southern subspecies of *microstoma*; the distributional pattern, so far as known, is discontinuous.

THE EULALIA PILIMANA COMPLEX

There are three nominal nearctic species of *Eulalia*, subgenus *Odontomyiina*, which are characterized by the long pile (longer in the male than

in the female) on the ventral side of the front basitarsus. *E. pilimana* (Loew), which has a patterned abdomen and a strong facial tubercle, occurs widely in Southern Canada and the northern half of the United States, from coast to coast; *E. borealis* (James), which has a patterned abdomen but only a weak facial tubercle or none at all, occurs east of the one-hundredth meridian, from Southern Canada to Florida; *E. aldrichi* (Johnson), which has an entirely green abdomen, occurs from Nebraska and Iowa (Ames) southward to Texas (Fort Davis), and also in Florida. The status of this species complex needs clarification. Except for Florida, records for the states south of Virginia and east of the Mississippi are lacking, but *E. borealis*, so named because at the time it was supposed to be more northern than *E. pilimana*, actually appears to overlap the distribution of *pilimana* completely in the East and to extend much farther southward. If it were not for this broad overlapping, this complex might assume the pattern of a superspecies.

The collection of the State Plant Board of Florida contains one male and one female, Nassau Co., May 28, 1955 (H. V. Weems), at *Cyrilla racemiflora*, one male, Alachua Co., April 27, 1955 (Weems), at *Melilotus alba*, and one female, Gainesville, May 6, 1922 (G. B. Merrill), which fit the definition of *E. borealis*; also, there are two females, Levy Co., Sept. 10, 1955 (R. A. Morse), *Polygonum hydropiperoides*, which compare very favorably with Kansas and Nebraska specimens of *E. aldrichi*. Whether these latter form an independent development or a genetic continuum with the more western populations is, on present evidence, a matter of speculation. The late seasonal date of the Florida specimens may be of some significance.

DISTRIBUTION IN FLORIDA OF THE OTHER SPECIES

Eulalia interrupta (Latreille). Jacksonville, April 14 (Mrs. A. T. Slosson; Fla. Plant Board). Sanford, "3-5-26" (Ohio State Mus.).

Eulalia virgo (Wiedemann). Gainesville, Alachua Co., May 12, 1927 (Alexander Walker; U. Mich.).

Eulalia rufipes (Loew). Common in the South; I have numerous records from Pinecrest and Naples in Collier Co.; Paradise Key, Key Largo, No Name Key, Sugarloaf Key, Tamiami Trail, and "40 mi. E. of Everglades" in Dade Co.; and Cape Sable Road, 5 miles west of the Dade Co. line, in Monroe Co. My northernmost records are Hudson, Pasco Co., July 9, 1948 (R. H. Beamer, U. Kansas), and Lake Alfred, Polk Co., May 27, 1955 (R. P. Esser, Fla. Plant Board). This species also occurs in Cuba.

Eulalia cincta (Latreille). This widespread nearctic species apparently occurs throughout most of the State. I have records from the following counties: Alachua (Gainesville, etc.), Levy, Seminole (Sanford), Brevard, Broward (Hallandale), and Dade (Miami).

LITERATURE CITED

James, Maurice T., and George Steyskal. 1952. A review of the nearctic Stratiomyini. Ann. Ent. Soc. Amer. 45: 385-412.

A NEW SPECIES OF *TELEBASIS* FROM FLORIDA (ODONATA: ZYGOPTERA)

MINTER J. WESTFALL, JR.

Department of Biology, University of Florida

E. B. and J. H. Williamson (1930) describe *Telebasis incolumis* from Baja California, comparing it with its nearest known relative, *T. salva* (Hagen). They state that their few specimens of *Telebasis* from Palm-dale, Florida, closely resemble *salva*, and if they represent an undescribed third species, it is "closer to *salva* than it is to *incolumis* and closer than *incolumis* is to *salva*." They add that "a larger series from Florida . . . should be in hand before a definite decision in the matter is attempted."

C. Francis Byers (1934) adds *T. salva* to the list of Odonata known from Florida. He records specimens collected on the University of Florida campus and at Micanopy. He also states that R. P. Trogdon has reared the species from Lake Wauberg in Alachua County. No mention is made of the 1930 paper to which I have just referred. Davis and Fluno (1938) tell of collecting *salva* in Central Florida during 1934 and 1935. Over a period of years I have taken many Florida specimens which have been labeled *T. salva* without critical study, and a number have been sent to correspondents.

The nymph of *T. salva* was first described by J. G. Needham (1904, p. 716) from specimens reared by F. B. Schaupp from Shovel Mount, Texas. In the brief description no mention is made of the number of lateral and mental setae. The only illustration is that of a median lamella (gill). Elsie B. Klots (1932, p. 83) repeats most of this description, adding the number of lateral setae as four to five, and mental setae three. These numbers given by Klots are repeated for *T. salva* in a table by D. C. Geijskes (1943) when he describes the nymph of *T. sanguinalis* Calvert, a South American species. As Geijskes points out, the nymph described by Klots (1932, p. 86) as *T. dominicanum* (Selys) is in reality *Enallagma coecum*.

In May, 1955, *Telebasis* nymphs from Green Sink on the University of Florida campus at Gainesville were reared. While working with our artist in making illustrations of the nymph of this genus for a forthcoming manual of the damselflies of North America, I noticed that my Florida nymphs consistently had only one mental seta, rather than three as reported by Klots for *salva*, and six lateral setae rather than four or five. I compared the adult males of *salva* from western states with the Florida specimens and noted some differences in the abdominal appendages. All *Telebasis* specimens, both adults and nymphs, from the Cornell University Collection were kindly loaned to me by Henry Dietrich. Two paratypes, male and female, of *T. incolumis* and all adults of *T. salva* from the Williamson Collection, including a large series from Madison County, Florida, were sent to me by Edward J. Kormondy.

During the summer of 1956 while at the Southwestern Research Station of the American Museum of Natural History near Portal, Arizona¹, I

¹ The very productive summer's work in the Southwest was made possible, in part, by a grant from the Penrose Fund of the American Philosophical Society, as well as aid from the Southwestern Research Station and the Florida State Museum.

collected many adults, and reared nymphs of *T. salva*. Adults were also taken in Texas.

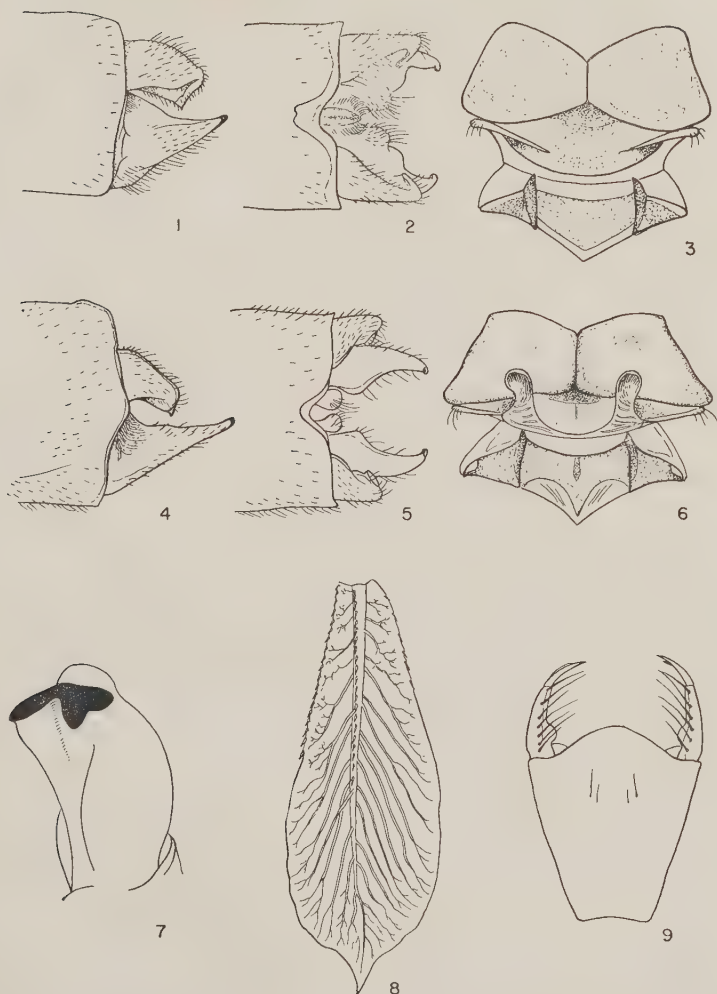
With reared specimens of *salva* from Arizona and California before me, I saw the great difference in the shape of the front edge of the mentum as compared with that of the Florida specimens, in addition to a difference in the numbers of mental and lateral setae. Also a striking contrast was found between the adult females, and I am convinced the Florida specimens represent a distinct species which is here described.

Telebasis byersi, n. sp.²

DESCRIPTION OF HOLOTYPE MALE. *Head*: Face red, or reddish, from labrum almost to level of median ocellus; sutures between labrum and clypeus, and between clypeus and frons, with a small black dot at each end; anterior surface of mandible with diffuse brown spot near edge bordering labrum; trochantin of mandible lighter in color than labrum; antenna with two basal segments same color as face, the second segment becoming darker toward its tip, remaining segments brown; frons above level of median ocellus black; each lateral ocellus with a triangular light spot adjacent to its anterolateral corner, and anterior side of each spot is concave; vertex same color as lower face; back of eyes, as well as labium, pale. *Pronotum*: Reddish or yellowish brown, with following dark markings: front lobe with a median spot extended laterally each side along the pale anterior border; middorsal impression and diffuse area each side of middle lobe; all of hind lobe except the posterior and lateral borders. *Synthorax*: Mesostigmal plates pale, with median dark spot, frame between them black; middorsal carina reddish, with black stripe each side about half as wide as mesepisternum and spreading along front border of this sclerite adjacent to mesostigmal plate; the black stripe is also abruptly widened above at two-thirds its length to become about three-fourths as wide as mesepisternum; elongate dark spot over impressed area above on humeral suture; mesepimeron with elongate dark stripe near humeral suture from near anterior border of sclerite to level of abrupt widening of dorsal black stripe; first lateral suture with dark line above; two small black spots along upper edge of lateroalar ridge, one each above the mes- and metepimeron; poststernum tipped with black; legs pale, spines except for comb of first tibia and three small basal spines of first femur which are the leg color, and tips of tarsal claws black. *Abdomen*: Red, brighter above, with numerous black teeth along posterior borders of segments 7-9; segment 7 darkened below, supposedly due to decomposition of contents in alimentary canal at this point. Superior appendage darkened above, and in profile view almost as wide at apex as at base, the upper margin convex throughout most of length; apical black tooth as in figs. 1 and 7, mesal view showing upper part bilobed. Inferiors slightly longer than superiors, with black apices.

DESCRIPTION OF ALLOTYPE FEMALE: Red or reddish of male replaced by light brown or yellowish brown; as in male, sides are paler; light spots beside the lateral ocelli are narrowly connected with light area of face; hind lobe of prothorax mostly pale, a very strong ridge extending inward

² Named for C. Francis Byers, whose *Contribution to the Knowledge of Florida Odonata* published in 1930 is well known to students of these insects.



Figs. 1-3 and 7, *Telebasis byersi*, n. sp. Figs. 4-6 and 8-9, *T. salva*. Figs. 1 and 4, lateral views, figs. 2 and 5, dorsal views of male abdominal appendages. Figs. 3 and 6, dorsal views of middle and posterior lobes of prothorax and mesostigmal plates. Fig. 7, mesal view of male superior appendage. Fig. 8, left lateral lamella (gill) of nymph. Fig. 9, labium of nymph. (All illustrations by Miss Esther Coogle)

from each side to about a third of the distance across its surface; just anterior to inner end of this ridge there is a very faint suggestion of a raised area. The abrupt widened area of black antehumeral stripe is hooked forward; abdominal appendages only very faintly black on inwardly directed tips; abdominal segments 2-8 each with a more or less distinct narrow dark ring near apex; joined to each ring in middle is an obscure darkened area.

VARIATIONS: Dark markings of both sexes quite variable; light areas beside lateral ocelli may be inclosed with black or narrowly connected with light color of face anteriorly; shape and length of metepimeral dark stripe variable, but it is present in all paratypes; degree of forking of antehumeral dark stripe variable; in some females dark area of hind lobe of prothorax more extensive than in allotype; many specimens, especially younger ones, have venter of abdomen darkened throughout much of its length; a weak place seems to be between segments 6 and 7, so that many specimens are broken there; shape of superior appendages varies slightly, and inferior may vary in length, but fig. 1 shows specimen with about maximum length; in most specimens inferiors are only slightly longer than superiors.

MEASUREMENTS: Holotype ♂, total length including appendages 28.5 mm., abdomen 22 mm., and hind wing 13.5 mm. Allotype ♀, total length 30 mm., abdomen 23 mm., and hind wing 15 mm. Paratype ♂ ♂, total length 25-31 mm., abdomen 19.5-24 mm., and hind wing 13-15.5 mm. Paratype ♀ ♀, total length 25-30 mm., abdomen 19-23.5 mm., hind wing 13.5-15.5 mm. In general, specimens from Madison County in Northwest Florida are smaller than those from Central Florida.

SPECIMENS EXAMINED: In the following notes the locations of the types are indicated in parentheses as follows: (U. of F.) University of Florida Collections; (M.J.W.) collection of M. J. Westfall; (U. of M.) Williamson Collection at Ann Arbor, Michigan; (C.U.) Cornell University Collection; (C.F.B.) collection of C. F. Byers. All specimens are from Florida.

Holotype ♂ and *allotype* ♀.—Bivin's Arm, near Gainesville, Alachua County, August 22, 1950, M. J. W. (U. of F.).

Paratypes (151 ♂ ♂, 24 ♀ ♀).—Alachua County: 6 ♂ ♂, Bivin's Arm, August 22, 1950, M. J. W. (M.J.W.); Univ. of Fla. campus, Gainesville, 6 ♂ ♂, May 13, 1922, J. S. Alexander (C.F.B.), 1 ♂, May 3, 1948, Lewis Berner (M.J.W.), 1 ♀, May 1950, M. J. W. (M.J.W.); Green Sink, Univ. of Fla. campus, 1 ♂ (emerged May 22), 1 ♀ (emerged May 26) reared from nymphs collected May 14, 1955, 2 ♂ ♂, September 9, 1956, 1 ♀, September 18, 1956, all by M. J. W. (U. of F.); Lake Wauberg, 2 ♂ ♂, reared April 12 and 20, 1934, R. P. Trogdon, 2 ♂ ♂, 1 ♀, April 1934 (C.F.B.); 33 ♂ ♂, 10 ♀ ♀, Cross Creek, August 19, 1950, M. J. W. (M.J.W.); 1 ♂, 2 ♀ ♀, reared from stream on Cross Creek road, summer of 1951, M. J. W. (M.J.W.). Glades County: Palmdale, 2 ♂ ♂, April 6, 1921, 2 ♂ ♂, April 7, 1921, 1 ♀, April 8, 1921, all J. H. Williamson (U. of M.); 1 ♂, Moore Haven, April 2, 1921, J. H. Williamson (U. of M.). Lake County: 2 ♂ ♂, March 12, 1922, T. P. Winter (C.F.B.). Madison County: 62 ♂ ♂, 6 ♀, Cypress Swamp, Greenville, August 30, 1932, E. B. Williamson, et. al. (U. of M.); 2 ♂ ♂, Aucilla River, one at, the other near, Pettis Spring, August 31 and September 7, 1932, E. B. Williamson, et. al. (U. of M.). Marion County: 4 ♂ ♂, Micanopy, May 1, 1930 (C.F.B.). Orange County: Wekiva River, 5 ♂ ♂, November 3,

1934, E. M. Davis, 7 ♂♂, April 19, 1935, E. M. Davis, 1 ♂, May 20, 1939, M. J. W. (all M.J.W.), 1 ♂, March 7, 1939 (C.U.), 1 ♂, 1 ♀, April 19, 1935, E. M. Davis (U. of M.), 2 ♂♂, September 20, 1939, M. J. W. (U. of M.). Volusia County: 4 ♂♂, April 21, 1935 (M.J.W.); 1 ♂, Blue Springs, April 24, 1938, E. M. Davis (M.J.W.).

NYMPH. A rather short, stocky nymph with broad head, in life generally green or brown with few definite markings; older nymphs ready to emerge show red of abdomen through nymphal skin, and other markings of adult become evident; two basal segments of antennae darker than remaining five segments; in living and recently killed specimens there are apparent vertical bands in compound eyes as shown in illustration; legs without dark bands; intersegmental membranes of abdomen show number of light longitudinal streaks; lamellae (gills) with irregularly pigmented tracheae, and spotting of membrane variable; generally there are several dark spots around margin of lamella, but they may be lacking, or in one specimen from Polk County pigment is so extensive as to produce rather well-defined bands across lamella, and membrane near base is browner.

Greatest width of median lobe (mentum) of labium is near lateral lobes and is about equal to length; front border almost *straight* and finely denticulated; two to three small setae at base of each lateral lobe, and about a dozen on each lateral margin; only one mental seta (one side of a single specimen from a total of 30 has two, and only rarely is there a single minute colorless

spine below the seta on one side). Lateral lobe with six setae (of 27 full-grown nymphs, two have five on one side, one of them with a double space between two setae but no darkened base evident, while one has seven on one side, and another deformed one has only four); movable hook well-developed; terminal border finely denticulated and pointed, but broader than end hook from which it is separated by a deep cleft. Wing pads at maturity reaching almost to end of segment 4. Abdominal segments without spines on lateral keels; segments 7 or 8-10 with row of



Nymph of *Telebasis byersi*, n. sp., with figures of labium and left lateral lamella (gill) removed.

short spines on posterior margins, continuing on to ventral surface in 8-10; few scattered spines may or may not be present on sides of 8-10; segments 2-4, and to a lesser extent segment 1, with numerous (100 or more) short stiff setae dorsally and laterally near base. Gonapophyses of female not reaching end of segment 10. Lamellae about as long as last five or six abdominal segments. Greatest width of lateral lamella at about two-thirds its length and equal to almost half the length of lamella; in terminal third lamella tapers quickly to a pointed tip; ventral margin setose for about four-ninths length of lamella, about 20 setae present; dorsal margin with only about six or seven setae for length of one-fourth the lamella; lateral keel with irregular cluster of about eight setae near base, followed by a single line of some 16 setae, extending slightly beyond the last seta of the ventral margin. Median lamella with about 12-14 dorsal setae, for about two-sevenths length of lamella; ventral margin with about six setae for one-fifth length of lamella; lateral keel with about 10-13 setae ending a little beyond last seta of dorsal margin. Tracheal elements more crowded and much branched in distal part of lamellae.

Total length, including lamellae, 13-16 mm., abdomen, 5.5-7 mm., caudal lamellae 3.5 mm. Only those nymphs with normal degree of extension of abdominal segments were measured, and details of structure, except for labial characters, were taken from only well-preserved specimens from Green Sink. Nymphs and exuviae include 5 ♂♂, 8 ♀♀ (1 ♂, 1 ♀, reared) from Green Sink, Univ. of Fla. campus, May 14, 1955; 2 ♀♀ reared at Gainesville in summer of 1951; 1 ♂, 2 ♀♀ (1 small, wing pads to end of segment 2) Santa Fe River, Alachua County, March 21, 1933; 2 ♂♂ (reared) Lake Wauberg, Alachua County, April 20, 1934; 4 ♂♂, 3 ♀♀, Alachua County, April 11, 1930; 1 ♂, 2 ♀♀ (♂ small, wing pads to end of segment 2) Peace Creek, Polk County, 2.5 mi. N. E. of Bartow, April 2, 1952. These 30 nymphs or exuviae are all in the collections of the University of Florida, C. F. Byers, and my own.

The nymphs collected in Green Sink were found living among the mass of floating duckweed which gives the sink its name. Very few other species live here. *Erythemis simplicicollis*, *Pachydiplax longipennis*, and *Ischnura posita* have also been collected at the sink.

NYMPH OF *Telebasis salva*.—Twenty-nine nymphs or exuviae from Arizona and California were studied. Eleven are from the Cornell Collection, the others from the University of Florida Collections.

Points in which these nymphs differ from those of *byersi* are the following: antennae completely devoid of pubescence except for an occasional very fine hair on second segment; hind angles of head with two to three dozen setae; lateral setae of labium seven (of 26 full-grown nymphs or exuviae, five specimens had six each side, and six others had six on one side, while the three young nymphs had six each side); mental setae two (of 29 nymphs or exuviae, only one young nymph had one each side, and one other with a deformed lateral lobe had one on one side plus a second very small one); movable hook shorter, about three-fourths as long as portion of lateral lobe basal to movable hook; end hook not so strongly developed; median lobe with width equal to about nine-tenths its length, front border *strongly convex* and angulated in middle; lateral

keels of segments 6-8 with several setae; segments 5-10 with a row of setae on posterior margin, continuing on to ventral surface in 7-10; setae more numerous on ventral side of abdomen. Greatest width of lateral lamella equal to about two-fifths its length; from here it tapers more gradually and to a longer point than in *byersi*; swollen sockets of its setae dark, but setae lighter and smaller than in *byersi*, making it difficult often to see them; on its lateral keel there is a marked tendency for the basal setae to be placed in a single straight line instead of irregularly clustered as is generally true in *byersi*. First antennal segment pale, as are segments 3-7; ventral surface of compound eyes much paler than dorsal surface; femora with a distinct, more or less complete, dark ring near apex.

REMARKS. Among the nymphs and adults of *T. salva* sent me from the Cornell University collection I am unable to find any specimens from Texas reared by Schaupp upon which the original description by Needham was based. I do not know where Elsie B. Klots obtained the labial counts of *T. salva* inserted in her description referred to above. If she obtained them from the specimens reported by Dr. Needham in 1904, there would be a question as to whether the nymphs described were really *Telebasis salva*, though I doubt this, and no other species of this genus has been reported from Texas. The characters given in the original description fit *salva*, though they might also fit nymphs of another species. The figure of a median gill does not match those of my specimens perfectly. Certainly if these reared nymphs were *T. salva* and possessed three mental setae and four to five lateral setae, they are unusual when compared with the good series I have from Arizona and California.

The key to nymphs of Coenagrioninae in *A Handbook of the Dragonflies of North America* (1929, pp. 282-283) by Needham and Heywood gives the number of lateral setae for *Telebasis* as 6-7. There seems to be a transposition of the numbers 7 and 8 in the couplets at the bottom of page 282; corrected, this would indicate two mental setae for *Telebasis*, and the numbers would then be correct for *T. salva*. In *A Guide to the Study of Fresh-Water Biology* (1938, p. 20) by J. G. and Paul R. Needham there is also confusion of numbers in couplets where *Telebasis* is involved. According to this key *Telebasis* would have to fit the statement "mental setae 3-7", though in the explanation with plate 7, *Telebasis* is listed as having 6-7 lateral and 2 mental setae. Whether this information is based on the original Texas material or specimens of *salva* which I have seen from the Cornell collection reared near Laguna Beach, California, in 1922 by Dr. Needham is not known.

I have noted that the black markings of adults of *T. byersi*, *incolumis*, and *salva* are almost identical, whereas other species show a very different pattern. Without the nymphs of *byersi* and *salva* one could be inclined to wonder if the differences in male appendages and female prothorax might not be variable and show intergradations. Such a difference as exists in the shape of the front border of the mentum of these two is not found as a variable character among nymphs of any other single species known to me. In the genus *Argia* the degree of convexity of this border is a very good specific character. Other differences pointed out also indicate that *byersi* is a very different species from *salva*. The dorsal mar-

gin of the male superior appendage of the adult *salva* tends to be straighter, that of *byersi* more convex. The superior in lateral view is narrower at the tip in *salva* than in either *byersi* or *incolumis*. The mesal view of *byersi* shows the black apical tooth to be larger and bilobed in the upper part, this upper part not being separated into a second tooth as in *salva* and *incolumis*.

It would be interesting to have nymphs of *incolumis* to see how different they are. After my study I question the statement referred to above by E. B. and J. H. Williamson with regard to the relationship of these three species. In a number of characters *byersi* does not seem to be nearer to *salva* than *incolumis* is, though I have studied only one pair of the latter, along with the description and illustrations. The male inferior appendages of *byersi* are characteristically shorter than in *salva* or *incolumis*. The females of *salva* and *incolumis* have similar prothoracic spines; *byersi* lacks them or has only the slightest indication of any. I have not made a careful comparison of venation of the three, and some good differences might be found there.

RANGES. Since 1930, specimens of *T. salva* have been taken which extend its known range to Kansas and Nevada. In the Williamson Collection there are 10 ♂♂ and 6 ♀♀ collected by Eldon Kile at Hunters Mill Pond, Sumner Co., Kansas, September 1 and 11, 1936. In the same collection is a single male collected by C. L. Hubbs and family, 1.5 mi. S. Springdale, Nye Co., Nevada, elevation 3675 ft., July 24, 1942. We now know *salva* from Kansas, Oklahoma, Texas, Arizona, California, and Nevada, as well as Mexico, Guatemala, Costa Rica, and Panama.

T. incolumis is known only from Baja California and was taken on the same stream with *salva*. *T. byersi* is known only from Florida, but its presence in Madison County near the Florida-Georgia border indicates that it may be expected at least in Southern Georgia. Its known range is separated by great distances from that of *salva* or *incolumis*.

ADDENDUM

After this paper was in galley several additional specimens of *T. byersi* came to hand which extend considerably the known range of this species. Through the kindness of Septima C. Smith and Robert S. Hodges of the University of Alabama at Tuscaloosa, and George H. Beatty of Pennsylvania State University, I have studied and determined the following specimens from their collections:

ALABAMA.—Houston County: Chattahoochee State Park, 1 ♂, September 1, 1938, collected by Martin.

NORTH CAROLINA.—Gates County: pond at Merchants Mill, 4 ♂♂, July 19, 1946, collected by G. H. Beatty, 2 ♀♀, June 27, 1951, 13 ♂♂, June 28, 1951, collected by G. H. Beatty, et al.

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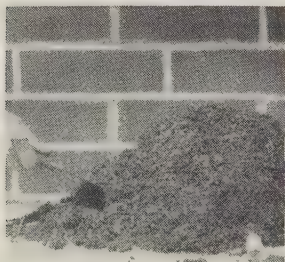


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NOTES AND COMMENTS ON THE SECOND MEDITERRANEAN FRUIT FLY INFESTATION

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A brief history of the second infestation in Florida of the Mediterranean fruit fly, *Ceratitidis capitata* (Wied.), was given by Denmark (1956). No information nor speculation, however, was given as to the time, place, method, manner or source of the infestation. Definite information on the matter is lacking, leaving only speculation.

Detection of larvae in grapefruit from his backyard trees aroused the interest and the suspicions of Mr. O. L. Prior and led to the discovery of the Mediterranean fruit fly in Florida, as pointed out by Denmark (1956). Mr. Prior, a winter-time resident of Miami Shores observed and became suspicious of "worms" in grapefruit as something "new". Factors which led to his inquiry and to detection of the Mediterranean fruit fly were (1) curiosity or interest, (2) high standard of living or aversion toward eating "wormy" food, (3) sufficient leisure time to satisfy his curiosity. A large segment of American citizens is in this category and performs services for others that are aside from selfish interests.

FLY INTRODUCTION.—Various entomologists have guessed at the time the fly was introduced into Florida. These guesses have ranged from less than one to perhaps three years previous to April, 1956. If but three to six flies were the original stock, 200-300 flies might have emerged as first generation flies after four to six weeks. After the second month, the fly population might have reached several hundred. Four to six months after the introduction, the numbers of flies could have reached hundreds of thousands. Astronomically large figures could be expected after eight to twelve months, provided conditions in South Florida were favorable for rapid multiplication. The writer estimates the fly was introduced in Florida about 18 to 24 months previous to its discovery.

At the time eradication measures were initiated, many fruit, even of apparently favored species, were uninfested. Although no data were taken and the examinations were not extensive, it was often necessary to cut two dozen or more fruit in order to locate any larvae. Many fruit appeared likely or possible hosts and yet were not infested. This is explained as an incomplete or an unsaturated infestation owing to lack of flies.

In connection with speculation as to the time of introduction of the fly consideration may be given to a trapping program conducted by the State Plant Board of Florida. In 1955 traps were placed on the Florida Keys and in several counties of Southern Florida. Although fermenting baits were used in McPhail glass traps the care and thoroughness of trap operation by the late Mr. O. D. Link gives much significance to this work. Several months were spent on the program during which no Mediterranean or other introduced fruit flies were found. If the fly had been abundant it would probably have been discovered at this time.

DISPERSION.—Whether the fly remained localized within a mile or two of the introduction site for several months, or whether early generation flies immediately began widespread distribution is not known. If the flies found favorable breeding sites near their point of origin, more localized distribution might have occurred. A favorable locale could conceivably absorb a much larger population than could be supported by an unfavorable one. An unfavorable locale might, on the other hand, give rise to more widespread dispersion than a favorable one. There is lack of entomological evidence to provide a guiding principle concerning this factor in the dispersion process. Although the housefly is considered a “wanderer” and disperses in terms of miles, without much regard for favorable stopping places, the fruit flies may or may not have different habits.

Unusual and infrequent movements of but few individuals to distant locations undoubtedly occurs with the Mediterranean fruit fly as with other organisms. Some individuals of a large population disperse to more distant locations than from a sparse population. Such occurrences sometimes suggest spot infestations instead of contiguous infestation.¹ This is especially true where insects are discovered in an area not previously recognized as infested. Movement of the fly as aided by man would be more frequent and more distant along highways connecting human habitations than between uninhabited areas. Movement of the fly without aid by man also would be discovered in the vicinities of human habitations more frequently than in intervening areas uninhabited by man, since more fly hosts grow and are in greater abundance in the vicinities of human habitations. Although the amount of man-given aid to the fly dispersion to distant areas in the present infestation is unknown, the writer feels that fly flights have been the more important. Competition of the fly against man for the same fruit has forced an association of man, the fly and fruit production; hence, the problem of co-existence.

Speculation as to the place of introduction is associated to some extent with the location and mode or manner of introduction. It appears most likely that the original fly stock became free somewhere in greater Miami. The initial find was in Miami Shores, where the abundance and frequency of infested fruit and properties in this area have suggested to the writer that this was the site of the introduction.

There seems little doubt that transportation by man was responsible for introduction of the fly. Infested fruit undoubtedly were brought from some country possessing the fly. There is no known evidence, however, to indicate which country provided the original stock. Transportation of infested fruit by airplane is suspected. Whether passenger or crew member was responsible is unknown; either is a possibility. Since Miami Shores may have been the site of introduction, there is also a possibility that “wormy” fruit were discarded from a yacht or other water craft. There is insufficient evidence to suspect commercial fruit shipments as being responsible for the introduction although the possibility of such an entry cannot be denied.

¹ Spot infestations refer to transportation of the fly as made by man and where contiguous infestations refer to insect movements unaided by man.

ERADICATION EFFORTS.—Following discovery of the species, State and Federal forces initiated eradication measures against the fly. Methods and procedures of the attacks are given in more detail elsewhere by others. These attacks, however, are predicated on the efficiency and use of attractant and poison materials having greater potency than have ever been used on such a large scale. It is paralleled, however, by "bait spraying," with "brown sugar or molasses, or both, water and arsenate of lead," which was reported effective by Hume (1929) in the previous successful eradication of the Mediterranean fruit fly in Florida.

ROLE OF FLORIDA AGRICULTURAL EXPERIMENT STATIONS.—Florida Agricultural Experiment Station workers are conducting tests on citrus, ornamental, subtropical and vegetable crop plants. These tests have included phytotoxicity studies in which applications of dieldrin, heptachlor, malathion, parathion, and ethylene dibromide were made. Residue studies of ethylene dibromide, malathion and parathion on avocado, pineapple, citrus, papaya, mango, tomato are being made. Fumigation studies are in progress on avocado, citrus, papaya, and other fruits to determine treatment effects on keeping, shipping, taste and other factors. Observations are being made to determine any secondary effects of the eradication program. Research programs were developed with the understanding that none would include living forms of the Mediterranean fruit fly itself, acquiescing to the active, operating, eradication program. Practically all Stations are contributing, in one form or another, to the immediate problems arising from the production and marketing of ornamental, fruit and vegetable crops.

Observations on secondary effects of wide-spread use of spray applications have been favorable to the eradication program. Mosquito populations generally have dropped abruptly following spray applications in an area and have increased slowly at first, then more rapidly, until the next spray application. Weight changes of honeybee colonies at the Sub-Tropical Experiment Station usually have declined through the summer season. It might be expected that any deleterious effects of spray applications would show decreases in weight. Only the usual zero slight plus and minus weight changes appear to have occurred to the two colonies weighed daily through this summer, although five aerial spray applications have been made. Reports of increases in number of insect species have been received, but these are not attributed to the spray applications.

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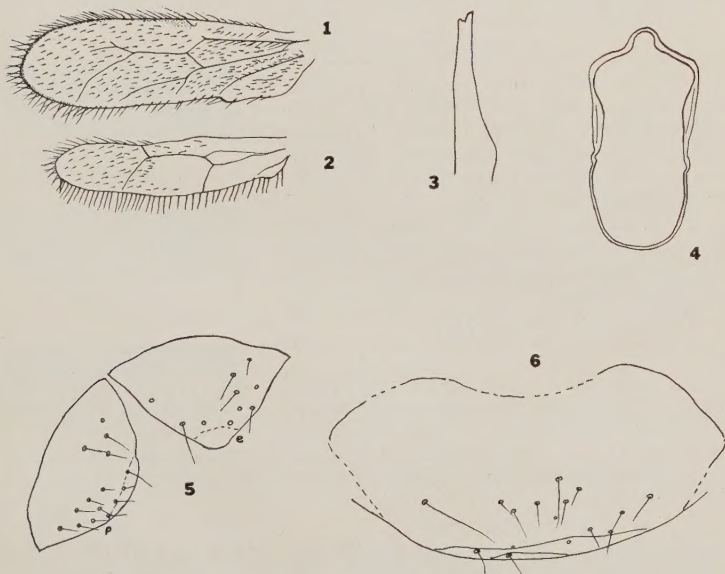
A NEW SPECIES OF *ARCHIPSOCUS* FROM FLORIDA (PSOCOPTERA: ARCHIPSOCIDAE)

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The new species described below was discovered late in a study of the taxonomy and comparative life histories of *Archipsocus* in the region of Gainesville, Florida; therefore, it was not included in an earlier paper on the genus (Mockford, 1953). It is a member of Badonnel's (1948) group II (designated subgenus *Archipsocopsis* Badonnel in my paper of 1953), in which females lack gonapophyses and are viviparous.

Archipsocus frater, n. sp.

DIAGNOSIS: similar to *A. parvulus* Mockford in color of the female and in shape of the phallic frame of the male. Differing in larger size, possession of tiny winglets on the male, and orange color of the male.



- Fig. 1. *Archipsocus frater* n. sp. ♀, forewing.
Fig. 2. *A. frater* n. sp. ♀, hindwing.
Fig. 3. *A. frater* n. sp. ♀, lacinia.
Fig. 4. *A. frater* n. sp. ♂, phallic frame.
Fig. 5. *A. frater* n. sp. ♀, epiproct (e), paraproct (p).
Fig. 6. *A. frater* n. sp. ♀, subgenital plate.

HOLOTYPE FEMALE: MACROPTEROUS

Measurements: total body length 1.572 mm.; forewing length 1.236 mm.; antennal length 0.706 mm.; hind leg: femur + trochanter 0.363 mm.; tibia 0.438 mm.

Morphology (from paratypes and holotype): antenna: discoid sensilla at about midpoint on f_1 , one subapical on f_1 , one apical on f_6 , f_8 , and f_{10} . Antennal segments in the ratio 1.00: 1.48: 1.92: 1.46: 1.36: 1.40: 0.97: 1.30: 0.89: 1.26: 0.87: 1.05: 1.68. Lacinia tip (fig. 3) with a long lateral prong and two median denticles. Venation of forewing (fig. 1) faint, but areola postica and M4+5 complete; radial stem distinct in basal fifth of wing, and An distinct throughout its length. Forewing membrane uniformly ciliated except for bare areas below radial stem where the vein is distinct, and bordering An. Ciliation of hindwing membrane confined to apical half. Hindwing venation (fig. 2) normal for the genus. Pigmented area of subgenital plate (fig. 6) with very shallow median impression. Paraprocts ciliated as in fig. 5, lacking trichobothria. Epiproct ciliated as in fig. 5.

Color (in alcohol): eyes black. Head and thorax dull brown. Abdomen paler brown. Forewings tan with darker band around margin from stigma sack to M4+5. Hindwings clear.

ALLOTYPE MALE: MICROPTEROUS

Measurements: total body length 1.124 mm.; forewing length 0.117 mm.; antennal length 0.585 mm.; hind leg: femur + trochanter 0.286 mm.; tibia 0.312 mm. Differs from holotype in smaller size, microptery and related lack of ocelli and simple thoracic tergal lobes. Phallic frame (fig. 4) with aedeagal arch protruding medially as in *A. parvulus*. Color more orange than in female.

Type Locality: Florida: Alachua County: Lake Alice. Holotype and allotype collected October 24, 1953. Paratypes: 1 ♂ and 6 ♀ collected at the type locality and nearby Gainesville from August 19 to November 5 (1952 and 1953).

Types remain for the present in my collection.

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